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SUBJECT OF INVESTIGATION

AIR POLLUTION ASTHMA
IN
OSAKA, JAPAN

RESPONSIBLE INVESTIGATOR

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Abstract:

A relationship of air pollution and respiratory illness has been shown in the Kanto Plain area among the armed forces but there is still no agreement as to the exact relationship and whether or not the disease as seen in the Yokohama area is a distinct clinical entity. The probability is that it is not, however, the relationship of asthma and air pollution is very striking and certainly causes an increased amount of difficulty in those who have had a previous history of allergy.

We have studied during the past year 77 cases and rejected 10 because of other disease processes other than chronic bronchitis, acute bronchitis, or bronchial asthma. We studied 67 cases by questionnaire and pulmonary function tests were completed on 54. There was one case (APS No. 76) who had a definite relationship of air pollution to his respiratory illness, having greatly improved in an air filtered and air cleaned room and when he returned to the outside recurrence of symptoms were noted and cleared again on admission to the hospital.

We are now prepared to take advantage of the forthcoming seasonal incidence of acute respiratory illness and expect to see more cases of acute bronchitis so that we may prove that the type of disease known as Tokyo-Yokohama asthma does occur in other areas as well, probably on the basis of industrialization and climate producing the smog which in turn produces exacerbations of the respiratory illness.

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Introduction:

Since 1946 American military physicians have noted an increased incidence of asthma among troops in the Kanto Plain area of Japan. The disease, at first, thought to be ordinary asthma, was later considered a new clinical entity. Distinctive features were: (1) Persons with no past history of asthma were afflicted. (2) Antihistamines were ineffective. (3) Rapid resistance to bronchodilators ensued. (4) Disease was most frequent in the fall and winter. (5) Dramatic improvement occurred when patients left the Tokyo-Yokohama area. (6) Relapse occurred on returning to the area. Later it was learned that (7) the degree of pulmonary disability was greater than had been appreciated, some patients exhibiting signs of irreversible lung damage[1].

Extensive investigation of the cause of this illness was conducted by the 406th Medical General Laboratory, 1950-57. It was learned that pollens were an unlikely cause, no correlation of pollen counts and asthma cases being observed. Air pollution was thought to be the cause because of the tremendous industrial concentration in this area, the frequent occurrence of smog in the winter, correlation of exacerbations of symptoms with low rainfall and wind velocity and increased dustfall. Some asthma cases had positive skin tests to antigenic extracts prepared from dust collected throughout an asthma season. It was felt that the disease was not confined to the Tokyo-Yokohama area but would occur wherever a combination of heavy industrial concentration mixed with mountainous background and a warm ocean current occurred. Such an area exists at Osaka-Amagasaki-Kobe, Japan. No concrete evidence that a similar type of asthma occurs here has been presented up to this time.

Recent work at the U.S. Army Medical Command, Japan[2], indicates that the syndrome of Yokohama asthma can be separated into three clinical entities: (1) a true asthma where the patients appear to be sensitized to an atmospheric antigen. These patients often have acute attacks of dyspnea and wheezing, an increased eosinophile count in the blood, respond to bronchodilators with significant improvement but may go into a resistant state if they remain in the area. They develop a remission if placed in a filtered air room but relapse on returning to an unfiltered atmosphere. On leaving the Tokyo area, they usually have no further asthma. (2) Acute bronchitis. These patients usually develop coughing and wheezing associated with acute respiratory infections. The disease is more severe than physicians are accustomed to seeing in other areas and is often misdiagnosed as asthma. There is no increase in the eosinophiles of the blood. The pulmonary function tests may be abnormal but the response to bronchodilators is modest. Although the disease may extend over four or more weeks, it is self-limited and complete recovery occurs even with

continued residence in the Tokyo area. (3) Chronic obstructive pulmonary disease. This group has pre-existing lung damage often of marked degree. They may cough and wheeze associated with infections of the bronchial tree or may develop asthma as in the group (1) patients. They may improve in a filtered air atmosphere or on leaving the Tokyo area, but, since they have chronic lung disease, pulmonary function tests remain abnormal and they may have difficulty in other parts of the world.

With the aid of history, differential white blood count, chest X-Ray, sputum culture and cytology examination, pulmonary function tests and response to therapy in a filtered air atmosphere, it is possible to separate the three clinical entities described above. Using these methods systematic investigation of asthma in Osaka could determine whether an air pollution induced asthma does exist. This is what we are investigating in Osaka.

Osaka, Japan, has many features which mimic Tokyo and would make it an ideal city to investigate this problem. It has a population of over 3.5 million, has a tremendous concentration of industry, is ringed by mountains and ocean and smog is a frequent problem. i.e., in December an average of 12.9 days. If we can prove that a disease similar to Yokohama asthma exists in this area, it is of the greatest importance to public health, as air pollution asthma may be an unrecognized problem in industrial areas throughout the world.

Methods:

Patients seen at the Yodogawa Christian Hospital, Osaka, Japan, with history of coughing and/or wheezing for 3 or more days when first seen in the clinic for that illness, have been evaluated as potential cases of air pollution respiratory disease. A standardized questionnaire was filled out, a complete blood count performed, sputum obtained for culture and cytology, chest x-ray, and pulmonary function tests were performed before and after administration of a bronchodilator examination as done by a physician. Other diseases such as tuberculosis, cancer, bronchiectasis, pneumonia, etc., were excluded.

Results:

TABLE I

SEX, AGE, AND DIAGNOSIS

Table I shows a summary of the checks and diagnosis of the 77 cases examined during the year. Ten cases were rejected due to either pulmonary disease other than asthma or bronchitis. The

most frequent cause was failure to cooperate. The total number of cases studied was 67 and pulmonary function tests were completed on 54 out of the 67.

TABLE II

AGE AND SEX DISTRIBUTION
OF THE
ENTIRE GROUP STUDIED BY CLINICAL DIAGNOSIS.

Table II shows the age and sex distribution of the group studied. There were 41 males and 26 females. Among the males there were 16 cases of bronchial asthma, 18 cases of chronic bronchitis, and 7 cases of acute bronchitis. Among the females there were 15 cases of bronchial asthma, 6 cases of chronic bronchitis, and 5 cases of acute bronchitis. According to age distribution, the largest group were in the 22-49 year old group with 27 cases, 16 male and 11 female. Acute bronchitis was the smallest in number and this was due to the time of the year when the examinations were carried out.

TABLE III

AGE AND SEX DISTRIBUTION OF GROUP
STUDIED BY PULMONARY FUNCTION TESTS

Pulmonary function tests were not done in some cases because of the patient's age or for technical reasons. Table III shows the number of cases in which pulmonary function tests were completed. There were 36 males and 18 females. The largest number of tests completed were in the 20-49 age group with 15 males and 8 females. Again due to the season when these tests were done the majority of tests were done on bronchial asthma patients. There were 27 out of the 54 cases done on asthma patients.

TABLE IV

RELATION OF AGE TO DIAGNOSIS BY
PULMONARY FUNCTION TESTS

There were 27 cases of asthma, 21 cases of chronic bronchitis, and 6 cases of acute bronchitis studied by pulmonary function tests. The largest group was in the 20-49 age bracket with 23 cases studied.

TABLE V

EOSINOPHILIA AT FIRST APS CLINIC VISIT

There were 12 cases of bronchial asthma who had an eosinophile count of more than 6%, there were 5 cases of chronic bronchitis, and 3 cases of acute bronchitis. This was a total of 20 cases that had an eosinophilia of more than 6%. There were also 5 cases of bronchial asthma, 2 cases of chronic bronchitis, and 3 cases of acute bronchitis for a total of 10 cases who had an eosinophilia of over 9% at the time of the first clinic visit.

TABLE VI

AGE AND SEX DISTRIBUTION ACCORDING TO % FEV_1

There were 11 men and 2 women who had a % FEV_1 less than 55%. There were 6 men and 9 women who had a % FEV_1 between 56% and 70%. There were 19 men and 7 women who had a % FEV_1 over 71%.

TABLE VII

AGE DISTRIBUTION ACCORDING TO % FEV_1

In all age groups there were 13 people examined who had a % FEV_1 less than 55%. There were 15 who had a % FEV_1 between 56% and 70%. There were 26 who had a % FEV_1 of more than 71%.

TABLE VIII

DIAGNOSIS AND SEX DISTRIBUTION ACCORDING TO % FEV_1

There were 6 cases of bronchial asthma which had a % FEV_1 less than 55%. There were 7 cases of chronic bronchitis with % FEV_1 of less than 55%. There were 9 cases of bronchial asthma whose % FEV_1 was between 56% and 70%. There were 5 cases of chronic bronchitis having a % FEV_1 between 56% and 70%. There was 1 case of acute bronchitis having a % FEV_1 between 56% and 70%. There were 12 cases of bronchial asthma with a % FEV_1 over 71%. There were 5 cases of acute bronchitis having a % FEV_1 over 71%.

TABLE IX

RELATION OF % VITAL CAPACITY TO % MAXIMAL BREATHING CAPACITY

The relation of % VC to % MBC shows that there were more, 44 cases, with an 81% or more vital capacity and very few, 3 cases, having a % vital capacity less than 50. In the % MBC there were only 21 cases having 81% or more and approximately an equal number, 19 cases, having a % MBC of 51 to 80. There were also 14 cases having a % MBC of less than 50%.

TABLE X

FEV_1 % - RESULTS OF BRONCHODILATOR

Table X shows the FEV_1 % (calculated using % FEV_1 after medication divided by % FEV_1 before medication multiplied by 100). In the cases not listed by results, this means either that the patient was tired after the first series of pulmonary function tests and couldn't repeat the test or that the first test was completely normal and no improvement was expected.

TABLE XI

COMPARISON OF VARIOUS TESTS

This Table cannot, of course, be statistically used but is put in to help us in deciding what is the best test or series of tests to use to try to determine improvement of the patients that we are studying. The parenthesis means the test was repeated after bronchodilator.

FIG. I

THE RELATION OF THE % MBC TO % VC

Fig. I shows what would be expected, a low % VC and a low % MBC grouping and a high % MBC and a high % VC grouping. However, there were a few patients, scattered, who did show a low % MBC but a normal % VC.

FIG. II

THE RELATION OF % FEV_1 to % VC

Fig. II shows approximately the same findings as were found in Fig. I with the same grouping of normal % vital capacity and normal % FEV_1, also the grouping of low % VC and low % FEV_1. Again there was a rather large group showing normal % VC and abnormal % FEV_1.

TABLE XII

RESULTS OF SELECTED ITEMS ON QUESTIONNAIRE FOR 54 PATIENTS

As it is impossible to analyze the questionnaire completely, on all patients, we selected certain items which seemed to be related to respiratory disease and the results are shown on Table XII. There were 28 smokers and 26 non-smokers. There were 44 who had a history of allergic disease or pulmonary disease and 10 who had no history. Forty-seven patients had a history of asthma and 17 did not. There was a history of cough and sputum in 98 and the interesting point of this is that there were 20 with night cough. As opposed to what Americans do as a rule, there were only 4 cases who slept with the windows open. There were 24 that had shortness of breath on exercise. There were 28 that had seasonal changes in their respiratory troubles. Thirty-five complained of some symptoms at the time of examination.

Discussion:

The exact relationship of respiratory illness and air pollution is something which requires a great deal of study today. As societies are industrializing, the problem of air pollution has become much more prevalent throughout the world.

It has been known that there has been some relation probably between air pollution and the increased incidence of respiratory diseases among the American troops in Japan since 1946 at the time of the occupation. There are many theories as to the relationship and even today after much study into the various pollutants, there is still not agreement as to the exact role of air pollution.

It is unfortunate that our study was not able to get under way until after the usual season for acute respiratory illnesses

which are increasing particularly since the beginning of the second year of the study.

There were 77 cases checked during the first year and 10 were rejected with a total of 67 studied by questionnaire and examination and pulmonary function tests were carried out on 54. Out of these, 1 case was definitely related to air pollution, we assume. There is always the possibility of something at home causing the illness as well, however, we are beginning to test all patients for house dust allergy to try to rule this out.

Attached is case report on APS No. 76 which is a characteristic finding of the type of respiratory illness seen by the armed forces in the Kanto Plain area. This was the only case which we found which was characteristic.

Smith et al[1] have reported on "Tokyo-Yokohama Asthma" and this is the picture of what has been seen in the Kanto Plain area in the armed forces. The problem of chronic disease occurring from air pollution is still not proven. Many of the patients reported, of course, were smokers, being in the armed forces and many in the younger age group. However, the relationship of smog, air pollution, and respiratory trouble at night is characteristic. This is also shown in our case report.

Spotnitz[2] recently reported on 32 cases who developed asthma in the Tokyo-Yokohama area and 32 patients who had had a previous history of asthma before coming to the area. It was his feeling that recognition of Yokohama asthma as a distinct clinical entity is unjustified. He also felt that it is probable that air pollution had a similar effect on patients in other industrialized areas and this feeling is borne out by our case report.

Table II shows the age and sex distribution of the entire group by clinical diagnosis and it shows that we had more males than females. This is helpful in that it does allow a closer comparison with the work being done at the Camp Zama Hospital at this time.

Comparisons of the various pulmonary function tests done shows that the 20 to 49 age group has the largest number, both male and female, and this again allows a better comparison with what is going on at Camp Zama Hospital, see Tables VI and VII.

There were 10 cases that had over 9% eosinophilia in the group that we studied and this was at the time of their first clinic visit, see Table V.

Although at this time we are unable to make any definite comments about the comparison of the various tests, we have used the % vital capacity, % FEV_1, % MBC, and the Wright peak flow as a comparison of the various tests to try to determine what might be called "laboratory" improvement. The purpose behind this is to try to determine whether or not one or more tests should be the criteria for improvement for discharge from the hospital. In Table XII we have tried to look at some of the answers to the questionnaire to decide which of the items are important in relation to respiratory illness. As yet we do not have sufficient numbers to make this a truly comparable study, however, it is noted that half of our patients were smokers and that the large majority of them had a previous history of allergy, asthma, or bronchopulmonary disease. There was a definite cough in all of the patients who came to us. In relation to exposure to air, very few Japanese leave their windows open at night, only 4 cases out of 54, whereas the opposite is probably true in Americans. Figures I and II show what might be expected as far as the relation of low % MBC and low % VC and low FEV_1 and low % VC. It is also true that the figures show a high % MBC and high % VC and high % FEV_1 and high % VC as expected. However, in both Figure I and Figure II there is a group that has a low % MBC and a low % FEV_1 as compared to % VC. This is an interesting finding which will have to be further studied.

Nemoto[3] has recently reported on the relationship between asthma attacks and the weather in Japan. This again shows the pattern of climate and particularly smog and the relationship of respiratory illness, particularly asthma.

Conclusion:

During the past year progress has been made on setting up procedures and getting ready to take advantage of the respiratory illnesses which appear about the first of each year. Unfortunately, due to lack of having equipment, our study was not able to get under way until the acute respiratory illness period was finished in the spring of 1965. Therefore, the study has been dealing largely with asthma patients, although there have been some chronic bronchitis, including emphysema, cases. There have been very few cases of acute bronchitis.

The pulmonary function tests show what would be normally expected, that is if the % MBC is low, we would expect to have a low % VC or if the % FEV_1 is low, we would expect to have a low % VC with the opposite also being true that if the % MBC is normal, we would expect a normal % VC and also if the % FEV_1 is normal, we would expect a normal % VC. However, there were instances where the % MBC and the % FEV_1 were low and yet the % VC was normal.

This needs to be more carefully evaluated in the second year.

There was a definite relationship of air pollution and respiratory illness as shown by the accompanying case report on APS No. 76. This proves that air pollution does play a part in the respiratory illnesses in this area and it is expected that during the coming year there will be more so that this can be conclusively proven.

REFERENCES

1. Tokyo-Yokohama Asthma. R. Smith, E. Kolb, H. Phelps, H. Weiss, and A. Hollinden. Arch Environ Health (Chicago), June 1964, 8: 805-815. (U.S. Air Force Hospital, Andrews Air Force Base, Washington, D.C.)

2. The Significance of Yokohama Asthma. Murray Spotnitz. The American Review of Respiratory Diseases, Vol. 92, Number 3, September 1965

3. Nemoto, Junkichi. Vol. 55, #9. November 27, 1965

Fig. I
Relation of % MBC to % VC

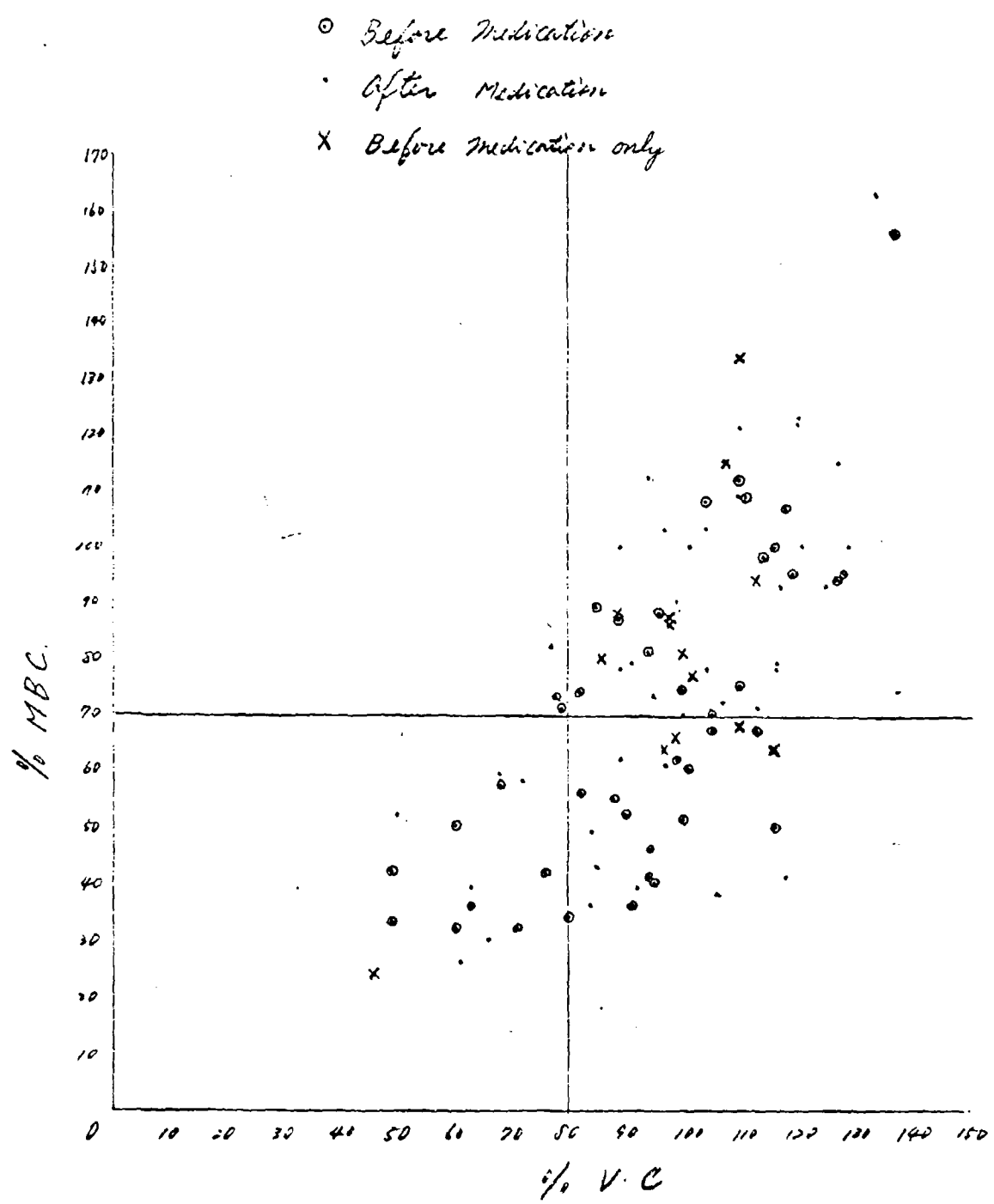

Fig. II
Relation of % FEV_1 to % VC

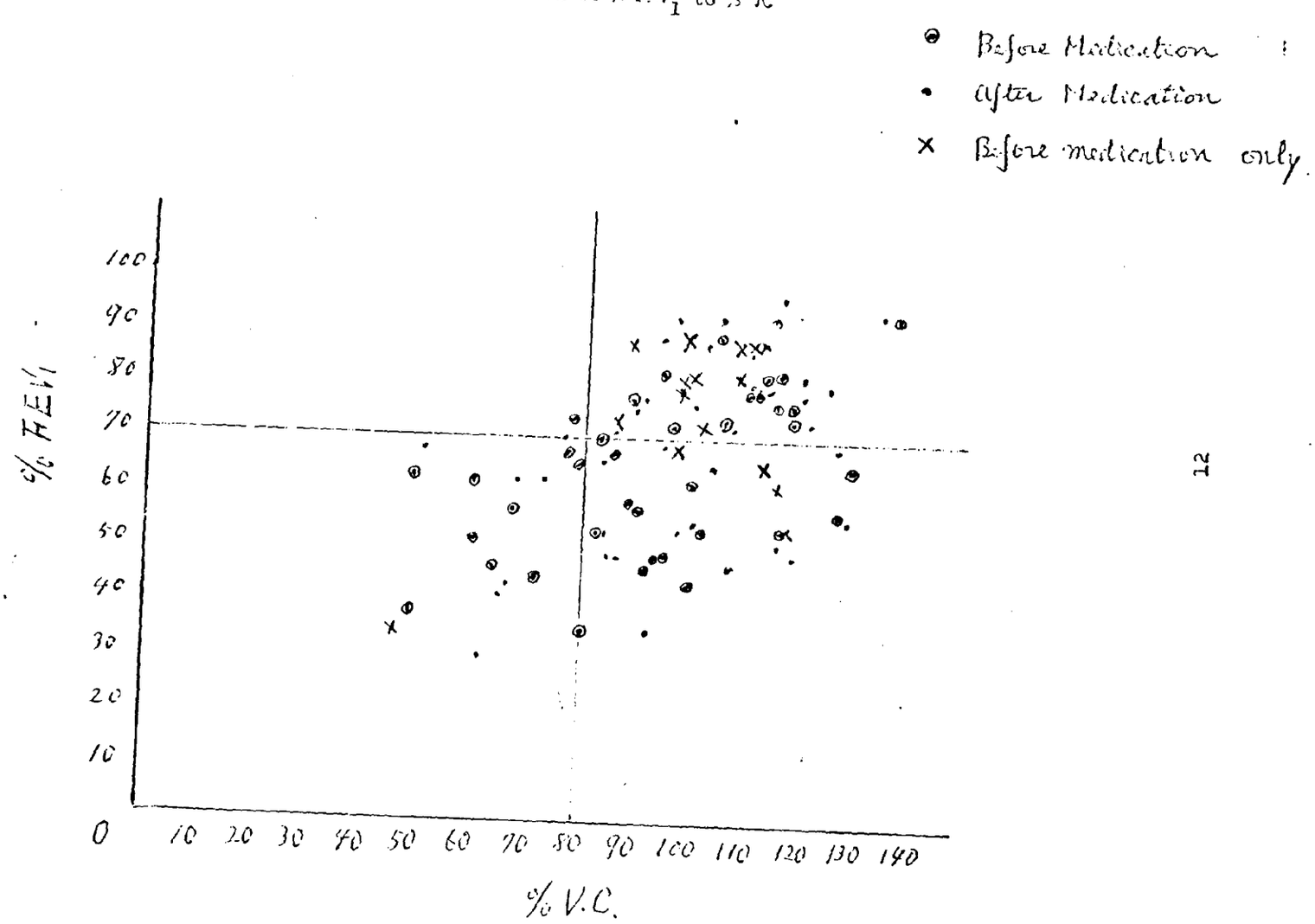

TABLE I

AGE, SEX, AND DIAGNOSIS

APS No.	Sex	Age	Impression	Effect of Admission	Remarks
1	M	9	Bronchial Asthma	(+)	Pulmonary function tests were variable
2	F	50	Bronchial Asthma		Pulmonary function tests were not done
3	M	11	Bronchial Asthma		Pulmonary function tests not well established
4	M	10	Bronchial Asthma		
5	M	11	Bronchial Asthma		
6	F	39	Bronchial Asthma with Chronic Bronchitis		Pulmonary function tests were not done
7	M	73	Emphysema with Pulmonary Infection		
8	M	69	Bronchial Asthma with Emphysema		
9	M	38	Bronchial Asthma with Minimal Pulmonary Tuberculosis	(-)	Psychosomatic Factor (+)
10	M	33	Bronchial Asthma		
11	F	31	Bronchial Asthma		Psychosomatic Factor (++)
12	M	26	Acute Bronchitis		Treat Organic Solvent
13	F	66	Emphysema with Bronchiectasis		
14	F	30	Bronchial Asthma		
15	F	60	Chronic Obstructive Lung Disease		
16	M	4	Acute Broncheobronchitis		
17	M	7	Acute Bronchitis		Pulmonary function tests were not done
18	F	40	Bronchial Asthma		Psychosomatic Factor (++) Pulmonary function tests were not done
19	F	23	Bronchial Asthma with Minimal Pulmonary Tuberculosis		

TABLE I continued

APS No.	Sex	Age	Impression	Effect of Admission	Remarks
20	M	6	Improved Asthma		Pulmonary function tests were not done
21	M	7	Bronchial Asthma		
22	M	77	Emphysema, Chronic Bronchitis, Old Pulmonary Tuberculosis		
23	M	33	Chronic Bronchitis		
24	M	62	Bronchiectasis		Reject
25	M	36	Bronchopneumonia		Reject
26	M	58	Chronic Bronchitis with Emphysema		
27	F	33	Bronchial Asthma		
28	M	6	Bronchial Asthma	(+)	West Indian
29	F	50	Bronchiectasis with Bronchiolitis		Reject
30	F	67	Chronic Bronchitis		
31	F	4	Asthmatic Bronchitis		Pulmonary function tests were not done
32	F	5	Acute Bronchitis		Pulmonary function tests were not done
33	M	31	Bronchial Asthma	(-)	Reject (no cooperation)
34	M	43	Bronchial Asthma		Pulmonary functio tests were not done
35	F	60	Adenocarcinoma of right lung		Reject
36	F	30	Bronchopneumonia		Reject American
37	F	55	Bronchial Asthma, Hypertension	(-)	Rejec
38	F	33	Acute Bronchitis with Neurosis		
39	M	64	Bronchitis with Liver Cirrhosis		Tests were not done
40	F	62	Senile Emphysema with Fibrosis		
41	M	35	Pharyngobronchitis, Acute Allergic		American
42	M	69	Pneumoconiosis, Pulmonary Tuberculosis, ASCVD		Reject
43	M	65	Chronic Bronchitis		

TABLE I continued

APS No.	Sex	Age	Impression	Effect of Admission	Remarks
44	F	5	Asthmatic Bronchitis		Pulmonary function tests were not done
45	F	11	Bronchial Asthma		
46	F	5	Acute Bronchitis (Allergic)		Pulmonary function tests were not done
47	M	28	Chronic Bronchitis		
48	M	27	Bronchial Asthma		
49	M	14	Chronic Bronchitis	(+)?	Admission in Aug. Since 1st admission no attack
50	M	60	Chronic Bronchitis with arterio-sclerosis		
51	M	10	Bronchial Asthma		
52	M	5	Acute Bronchitis		Pulmonary function tests were not done
53	F	42	Chronic Bronchitis		Pulmonary function tests were not done
54	F	10	Bronchial Asthma		
55	F	8	Bronchial Asthma		
56			Number was omitted		
57	M	39	Chronic Bronchitis		
58	M	29	Bronchial Asthma		
59	M	64	Obstructive Lung Disease		
60	M	67	Chronic Bronchitis, Fibrosis with Emphysema		
61	F	22	Rule out Brochiectasis		Reject
62	F	45	Bronchial Asthma		Psychosomatic factor (+)
63	F	46	Bronchial Asthma		Reject (No cooperation. Pulmonary function tests not done

TABLE I continued

APS No.	Sex	Age	Impression	Effect of Admission	Remarks
64	M	45	Chronic Bronchitis		
65	F	21	Bronchial Asthma		
66	M	26	Bronchial Asthma		
67	F	32	Chronic Bronchitis with suspicion of Bronchiectasis		
68	F	20	Bronchopneumonia		Reject (No cooperation. Pulmonary function tests were not done
69	F	17	Bronchial Asthma		Psychosomatic factor (++)
70	F	60	Bronchial Asthma		Psychosomatic factor (++)
71	M	55	Bronchial Asthma, Obstructive Lung Disease		Phosphorus contact in past
72	M	61	Emphysema with Fibrosis, Rule out Ectasis	(-)	Cotton Contact
73	M	42	Chronic Bronchitis		Led, copper contact
74	M	24	Chronic Bronchitis		
75	M	34	Acute Bronchitis with Minimal Pulmonary Tuberculosis		
76	M	36	Acute Bronchitis	(++)	Chemical Solvent contact
77	M	62	Chronic Bronchitis		
78	M	60	Chronic Bronchitis		

Summary:

Total Cases	77
Reject	10
Cases studied	67
Pulmonary function tests	54

TABLE II

AGE AND SEX DISTRIBUTION
OF THE
ENTIRE GROUP STUDIED BY CLINICAL DIAGNOSIS

Sex \ Age	Diagnosis	- 9	10-19	20-49	50-65	66	Summary
Male	Asthma	4	4	6	1	1	16
	Chronic Bronchitis	0 → 7	1 → 5	6 → 16	8 → 9	3 → 4	18 → 41
	Acute Bronchitis	3	0	5	0	0	7
Female	Asthma	1	3	8	3	0	15
	Chronic Bronchitis	0 → 5	0 → 3	2 → 11	2 → 5	2 → 2	6 → 26
	Acute Bronchitis	4	0	1	0	0	5
	Total	12	8	27	14	6	67

TABLE III

AGE AND SEX DISTRIBUTION OF GROUP STUDIED BY PULMONARY FUNCTION TESTS

Sex \ Age	Diagnosis	- 9	10-19	20-49	50-65	66	Summary
Male	Asthma	4	3	6	1	1	15
	Chronic Bronchitis	0 → 5	1 → 4	5 → 15	7 → 8	3 → 4	16 → 36
	Acute Bronchitis	1	0	4	0	0	5
Female	Asthma	1	3	6	2	0	12
	Chronic Bronchitis	0 → 1	0 → 3	1 → 8	2 → 4	2 → 2	5 → 18
	Acute Bronchitis	0	0	1	0	0	1
	Total	6	7	23	12	6	54

TABLE IV

RELATION OF AGE TO DIAGNOSIS BY PULMONARY FUNCTION TESTS

Diagnosis \ Age	- 9	10-19	20-49	50-65	66	Total
Asthma	5	6	12	3	1	27
Chronic Bronchitis	0	1	6	9	5	21
Acute Bronchitis	1	0	3	0	0	6
Total	6	7	23	12	6	54

TABLE V

Study No.	Sex	Diagnosis	% Eosinophilia
1	M	Asthma	3
4	M	Asthma	11
5	M	Asthma	6
7	M	Chronic Bronchitis	1
8	M	Asthma	1
9	M	Asthma	2
10	M	Asthma	2
11	F	Asthma	2
12	M	Acute Bronchitis	0
13	F	Asthma	2
14	F	Asthma	0
15	F	Chronic Bronchitis	1
16	F	Acute Bronchitis	12
19	F	Asthma	2
20	M	Asthma	1
21	M	Asthma	18
22	M	Chronic Bronchitis	0
23	M	Chronic Bronchitis	7
26	M	Chronic Bronchitis	4
27	F	Asthma	1
28	M	Asthma	3
30	F	Chronic Bronchitis	0
34	M	Asthma	3
37	F	Asthma	6
38	F	Asthma	1
40	F	Chronic Bronchitis	1
41	F	Acute Bronchitis	5
43	M	Chronic Bronchitis	1
45	F	Asthma	12
48	M	Asthma	3
49	M	Chronic Bronchitis	6
50	M	Chronic Bronchitis	2

TABLE V continued

Study No.	Sex	Diagnosis	% Eosinophilia
51	M	Asthma	8
54	F	Asthma	6
55	F	Asthma	15
57	M	Chronic Bronchitis	10
58	M	Asthma	15
59	M	Chronic Bronchitis	2
60	M	Chronic Bronchitis	6
62	F	Asthma	1
64	M	Chronic Bronchitis	1
65	F	Asthma	3
66	M	Asthma	6
67	F	Chronic Bronchitis	5
69	F	Asthma	6
70	F	Asthma	7
71	M	Asthma	3
72	M	Chronic Bronchitis	9
73	M	Chronic Bronchitis	1
75	M	Acute Bronchitis	9
76	M	Acute Bronchitis	16
77	M	Chronic Bronchitis	5
78	M	Chronic Bronchitis	5

Totals:

Over 6%

Asthma	12
Chronic Bronchitis	5
Acute Bronchitis	3
	20

Over 9%

Asthma	5
Chronic Bronchitis	2
Acute Bronchitis	3
	10

TABLE VI

AGE AND SEX DISTRIBUTION ACCORDING TO % FEV_1

Sex	Age	% FEV_1 - 55%	% FEV_1 56-70	% FEV_1 71 -	Total
Male	0-9	0	0	5	5
	10-19	1	0	3	4
	20-49	3	3	9	15
	50-65	4	3	1	8
	66-	3	0	1	4
Sub-total		11	6	19	36
Female	0-9	0	1	0	1
	10-19	0	1	2	3
	20-49	0	3	5	8
	50-65	2	2	0	4
	66-	0	2	0	2
Sub-total		2	9	7	18
TOTAL		13	15	26	54

When tests were done on several occasions, average values are used.

TABLE VII

AGE DISTRIBUTION ACCODING TO FEV_1

Age	% FEV_1			Total
	-55%	56-70	71-	
0 - 9	0	1	5	6
10 - 19	1	1	5	7
20 - 49	3	6	14	23
50 - 65	6	5	1	12
66 -	3	2	1	6
Total	13	15	26	54

TABLE VIII

DIAGNOSIS AND SEX DISTRIBUTION ACCORDING TO % FEV_1

Diagnosis	Sex	% FEV_1 -55%	% FEV_1 56-70	% FEV_1 71-	Total
Asthma	M	5	3	7	15
	F	1	6	5	12
		6	9	12	27
Chronic Bronchitis	M	6	2	8	16
	F	1	3	1	5
		7	5	9	21
Acute Bronchitis	M	0	1	4	5
	F	0	0	1	1
		0	1	5	6
Total		13	15	26	54

TABLE IX

RELATION OF % VITAL CAPACITY TO
% MAXIMAL BREATHING CAPACITY

% VC			% MBC		
- 50	51 - 80	81 -	- 50	51 - 80	81 -
3	7	44	14	19	21

TABLE X

FEV_1 % RESULTS OF BRONCHODILATOR

Study No.	%	Study No.	%	Study No.	%
1	93	27	106	66	109
4	100	34	123	67	100
5	114	40	98	70	93
7	100	43	100	71	100
8	109	47	128	72	91
9	116	48	123	75	106
10	100	49	103	76	90
11	109	50	100	77	98
13	108	57	109	78	102
14	105	58	80		
15	104	59	98		
19	114	60	111		
20	104	61	87		
21	95	62	104		
22	96	64	98		
26	77	65	105		

TABLE XJ

COMPARISON OF VARIOUS TESTS

APS#	Sex	% VC	% FEV_1	% MBC	WPF	Date
1	M	78 (95)	74 (69)	73 (73)	100	13/Apr.
		154	85	145	290	10/Aug.
		143	71	132	270	31/Aug.
4	M	137 (134)	93 (93)	156	390	6/Apr.
5	M	100 (116)	44.6 (51)	51 (78)		25/Feb.
7	M	82 (89)	53 (53)	56 (62)	160	15/Apr.
8	M	71 (85)	45 (49)	32 (43)		8/Apr.
		75 (97)	48 (64)	34 (53)	150	27/Apr.
		103 (97)	27 (32)	37 (37)	150	21/May
9	M	68 (89)	57 (66)	57 (78)	220	25/Feb.
		51 (66)	34 (30)	18.4 (25)	70	22/July
		98	52	52	245	11/Nov.
10	M	60 (68)	63 (63)	50 (59)		25/Feb.
11	F	110 (110)	79 (86)	112 (121)		25/Feb.
12	M	110	86	134		25/Feb.
13	F	49 (50)	63 (68)	42 (52)	80	26/Feb.
14	F	115 (125)	76 (80)	67 (93)	300	26/Feb.
		61 (88)	51 (57)	24 (43)	75	27/Apr.
15	F	82 (89)	70 (73)	74 (100)		9/Apr.
16	M	110	87	68		18/Mar.
19	F	90 (104)	57 (65)	52 (78)		19/Mar.
20	M	114 (117)	92 (96)	98 (93)		23/Mar.
21	M	116 (120)	82 (78)	100 (122)	160	6/Apr.
22	M	63 (66)	46 (44)	36 (30)		9/Apr.
		80	44	42	105	23/Apr.
		74 (75)	47 (43)	33 (36)	75	28/Sept.
		69 (79)	35 (38)	41 (49)	85 (90)	30/Nov.
23	M	86	84	80	430	13/Apr.
24	M	105	74	96	400	16/Apr.
25	M	119	80	124	560	30/Apr.
26	M	49 (61)	39 (30)	33 (26)	95	30/Apr.
27	F	119 (120)	77 (82)	95 (123)	390	27/Apr.
28	M	98	89	86	190	16/Apr.
29	F	73	81	58	195	23/Apr.
		80 (77)	67 (67)	74 (68)	180	21/Sept.
30	F	113	66	94	265	23/Apr.
34	M	101 (100)	53 (65)	60 (70)	360	20/May
35	F	85	69	66	180	28/May
		91	78	68	240	16/July
36	F	97 (99)	87 (83)	76 (79)	360	21/May
37	F	46	35	24		6/May
38	F	89	87	88	395	18/June
40	F	83	42	39	120	28/May
		85	43	31	110	29/June
		94 (118)	49 (48)	41 (41)	90	9/July

TABLE XI continued

APS#	Sex	% VC	% FEV_1	% MBC	WPF	Date
		81 (104)	54 (46)	28 (41) 25	90	6/Aug. 20/Aug.
41	M	100	81	81	590	11/June
42	M	103	43	65	185	8/June
		106	41	57	175	25/June
43	M	93	74	88	350	11/June
		89 (91)	72 (77)	87 (79)	330	17/Aug.
45	F	99	81	66	180	15/June
		114	70	72	230	18/June
47	M	96 (97)	72 (92)	88 (103)	560	8/July
48	M	100 (99)	62 (76)	74 (90)	420	8 /July
49	M	104 (104)	89 (92)	108 (103)	390	8/July
		101	92	105	350	6/Aug.
		103	89	111	370	10/Aug.
50	M	80 (92)	35 (35)	34 (39)	125	22/July
51	M	102	71	77	175	12/July
54	F	116	61	64	160	17/Aug.
55	F	97	69	64	180	17/Aug.
57	M	79 (84)	65 (71)	71 (36)	400	19/Aug.
		98 (94)	71 (81)	62 (46)	425	17/Sept.
		88	79	76	425	11/Nov.
58	M	60 (63)	51 (41)	32 (39)	145	2/Sept.
59	M	95 (84)	49 (48)	40 (49)	135	2/Sept.
		104 (113)	54 (60)	54 (81)	220 (345)	29/Oct.
60	M	111 (101)	79 (88)	109 (100)	450	2/Sept.
61	F	81 (84)	78 (68)	60 (68)	340	3/Sept.
62	F	85 (77)	67 (70)	89 (81.5)	205	14/Sept.
		92 (92)	57 (55)	67 (71)	165 (165)	29/Oct.
		99 (99)	62 (62)	77 (71)	195 (235)	9/Nov.
64	M	113 (113)	82 (80)	67 (71)	400	16/Sept.
65	F	105 (107)	73 (72)	70 (72)	355	20/Sept.
		107 (103)	75 (79)	68 (80)	375	15/Oct.
		110 (105)	76 (80)	78 (91)	405 (410)	22/Oct.
		102 (114)	68 (79)	66 (75)	385 (365)	2/Nov.
66	M	94 (94)	82 (89)	81 (112.3)	405	24/Sept.
		101 (104)	78 (91)	91 (113)	400	5/Oct.
		99 (101)	64 (80)	54 (99)	320 (430)	2/Nov.
67	F	118 (121)	73 (73)	107 (100)	390	14/Oct.
69	F	98	80	87	360	15/Oct.
70	F	76 (72)	67 (62)	42 (58)	185 (185)	4/Nov.
71	M	116 (116)	54 (54)	50 (79)	230 (250)	28/Oct.
		122 (118)	60 (62)	88 (98)	240 (280)	12/Nov.
		116 (117)	60 (59)	78 (82)	270 (330)	3/Dec.
		130 (120)	61 (60)	70 (88)	250 (330)	10/Dec.

TABLE XI continued

APS#	Sex	% VC	% FEV_1	% MBC	WPF	Date
72	M	114	57	85	325	19/Nov.
		88 (97)	58 (53)	55 (61)	195 (185)	25/Nov.
		91	51	48	225	10/Dec.
73	M	108	82	115	430	4/Nov.
75	M	128 (127)	65 (69)	95 (115)	360 (480)	18/Nov.
76	M	110 (110)	88 (79)	75 (109)	425 (425)	26/Nov.
		110 (108)	95 (98)	142 (148)	520 (505)	30/Nov.
		113 (115)	70 (75)	127 (129)	410 (420)	9/Dec.
		120 (119)	83 (83)	147 (151)	455 (500)	14/Dec.
77	M	127 (129)	56 (55)	94 (100)	360 (310)	2/Dec.
78	M	91 (106)	46 (47)	36 (38)	150 (170)	2/Dec.

(___) indicates repeated test after bronchodilator.

TABLE XII

Results of Selected Items on Questionnaire
for 54 Patients

	A	B	C	D	E	F	G	H	Results	
28	Don't Smoke 26	Stopped 6 mos. 2	1-10 Cig/da 10	11-20 Cig/da 15	21-30 Cig/da 0	31-40 Cig/da 0	40+ Cig/da 1	Cigar 0	Smokers 28	None or Unknown 26
33	Pneumonia 14	Bronchitis 25	Sinus 9	Hives 6	Rash 14	None 7	Unknown 3		Bronchopulmonary Disease or Allergy History 44	10
34	Family Asthma 24	Asthma Child 7	Asthma Adult 16	None 15	Unknown 2	Hay Fever 0			Asthma History 47	17
38	Windows Yes 4	Open No 50	Unknown 0						Winter 4	50
37	Cough Persistent 20	No Sputum 3	Sputum 36	Winter 7	All year 12	Night 20	No 0	Unknown 0	History 98	0
39	Exercise SOB Light 22	SOB Rest 2	No Obv. SOB 29	Unknown 1					Tolerance 24	30
41	Seasonal Summer 1	Trouble Fall 12	Winter 10	Spring 2	All year 3	Unknown 28			Change 28	28
42	First Symptom Cough 13	Wheeze 15	SOB 5	Tired 2	Other 0	Unknown 24			First Symptom 35	24

CASE REPORT (APS No. 76)

The patient (H.Y.), 36 year old factory worker came to the Medical Outpatient Department because of sore throat and cough on November 17, 1965.

The patient had a cough of mild degree last winter but no wheezing. Also the patient denied sinusitis, urticaria, eczema, or family history of bronchial asthma. He was born in Osaka City and has lived in Osaka City, his factory is on the north side of Osaka City and makes tin foil.

Physical examination on his first visit revealed a reddish throat, moderate piping in lungs. Bronchodilator, expectorant and sulfaisoxale preparation were given. Five days later the patient came in the hospital (A room) because of worse wheezing and cough. From the third hospital day the patient was feeling much better except for a mild cough in the early morning and physical examination showed no piping in the day time. From the sixth hospital day the patient had no more cough even in the early morning. Then on the ninth hospital day the patient was discharged. Two days later the patient came to the Medical Outpatient Department because of wheezing and cough. Five days later the patient had to be hospitalized (B room). Two days later the patient was getting slightly better but still had moderate wheezing. Such symptoms continued and on the seventh hospital day the patient was transferred to A room. Thereafter, two days later the patient was feeling much better and physical examination showed no more piping. (December 15, 1965)

On December 24, 1965 (eighteenth day) the patient tried to go home because of much improvement and because of the Christmas holiday, but patient returned to the hospital with wheezing and cough. Five days later the patient became better and was discharged with medication of Penicillin V-oral, bronchodilator and cough medicine. Six days later (January 6, 1966) patient came to the special clinic for this study and complained of cough in the early morning but physical examination showed no piping in the lungs.

CASE REPORT - APS No. 76

Name H.Y. OPD# _____ Admission _____ Discharge _____

FIRST YEAR

Item \ Date	17/Nov.	24/Nov.	25/Nov.	27/Nov.	30/Nov.	8/Dec.	9/Dec.	13/Dec.	14/Dec.
WBC	13,100	4,700		3,000	5,050	7,900		5,900	
Neutrophiles	80%	50		43	52	71		42	
Eosenophiles	1%	16		10	10	4		11	
Sed-rate	6mm	15			2				
% VC			110		110		113		120
% FEV_1			79		95		70		83
% MBC			109		142		127		147
A.T. Index			-12		-1		-4		-1
WPF Rate			425		520		410		455
	First Visit	22/Nov.			Dis-charge	7/Dec. Admis-sion to B-room		Trans-fer to A-room	
Medication		22/Nov.							
Chemotherapy	(+)	(+)			(+)	(+)			(+)
Bronchodilator	(+)	(-)			(-)	(-)			(-)

At OPD Aminophyllin I.V. Inj.

7-10/Dec. Day nite P.O.-P.R.N.

CASE REPORT - APS No. 76 continued

Name H.Y. OPD#_____ Admission_____
Discharge_____

SECOND YEAR

Item \ Date	17/Dec.	21/Dec.	24/Dec.	29/Dec.	31/Dec.
WBC	8,500			7,600	
Neutrophiles	45			58	
Eosenophiles	9			10	
Sed-rate	5				
% VC	119	120	125	111	
% FEV_1	80	82	88	53	
% MBC	139	130	159		
A.T. Index	-3	0	2		
WPF Rate	460	500	520	245	
			24-27 Home Stay		Discharge
Medication					
Chemotherapy	(+)				(+)
Bronchodilator	(-)				(+)